

CLAIMS**We Claim:**

- 1 1. A structure comprising:
2 at least a first array of a plurality of cellular housings; and
3 at least one cellular core disposed in at least a substantial number of said
4 cellular housings.
- 1 2. The structure of claim 1, further comprising:
2 at least a second array of a plurality of cellular housings; and
3 at least one cellular core disposed in at least a substantial number of said at
4 least second arrays of cellular housings.
- 1 3. The structure of claim 1 or 2, further comprising:
2 a first panel disposed on one of said arrays of cellular housings.
- 1 4. The structure of claim 3, further comprising:
2 a second panel disposed on one of said arrays of cellular housings distal from
3 said first panel.
- 1 5. The structure of claim 4, wherein at least a plurality of said cellular
2 housings have a rectangular shape.
- 1 6. The structure of claim 5, wherein at least a plurality of said cellular
2 cores have a shape of at least one of tripod truss, quad pod truss, tetrahedral, cube,
3 hexagon, pyramidal, kagome, cube, hexagon, cluster of solid or hollow spheres, or
4 combinations thereof or other non-limiting arrangements.
- 1 7. The structure of claim 5, wherein at least a plurality of said cellular
2 cores comprise open and/or closed cell foams or other porous materials.
- 1 8. The structure of claim 5, wherein at least a plurality of said cellular
2 cores comprise granular powders or other porous materials.

1 9. The structure of claim 5, wherein at least a plurality of said cellular
2 cores comprise at least one of a) random aggregate of hollow or solid powder particles
3 (with or without interparticle bonding); b) stochastic foam; c) porous or solid
4 materials; d) periodic cellular structures; e) solid powder aggregates; f) lightweight,
5 highly compliant materials such as elastomers; g) low density polymers, metal,
6 ceramic or polymer foams; or h) polymer cast into the cellular housing (or cellular
7 core itself), or combinations thereof of or other non-limiting arrangements.

1 10. The structure of claim 4, wherein at least a plurality of said cellular
2 housings have triangular shape.

1 11. The structure of claim 10, wherein at least a plurality of said cellular
2 cores have a shape of at least one of pyramidal, quad pod, tripod, cluster of solid or
3 hollow spheres, cube, hexagon, tetrahedral, pyramidal, or kagome, or combinations
4 thereof or other non-limiting arrangements.

1 12. The structure of claim 10, wherein at least a plurality of said cellular
2 cores comprise open and/or closed cell foams or other porous materials.

1 13. The structure of claim 10, wherein at least a plurality of said cellular
2 cores comprise granular powders or other porous materials.

1 14. The structure of claim 10, wherein at least a plurality of said cellular
2 cores comprise at least one of a) random aggregate of hollow or solid powder particles
3 (with or without interparticle bonding); b) stochastic foam; c) porous or solid
4 materials; d) periodic cellular structures; e) solid powder aggregates; f) lightweight,
5 highly compliant materials such as elastomers; g) low density polymers, metal,
6 ceramic or polymer foams; or h) polymer cast into the cellular housing (or cellular
7 core itself), or combinations thereof of or other non-limiting arrangements.

1 15. The structure of claim 4, wherein at least a plurality of said cellular
2 housings have a tubular shape.

1 16. The structure of claim 15, wherein at least a plurality of said cellular
2 cores comprise cluster of solid or hollow spheres, pyramidal, quad pod, tripod, cube,
3 hexagon, tetrahedral, pyramidal, or kagome, or combination thereof or other non-
4 limiting arrangements.

1 17. The structure of claim 15, wherein at least a plurality of said cellular
2 cores comprise open and/or closed cell foams or other porous materials.

1 18. The structure of claim 15, wherein at least a plurality of said cellular
2 cores comprise granular powders or other porous materials.

1 19. The structure of claim 15, wherein at least a plurality of said cellular
2 cores comprise at least one of a) random aggregate of hollow or solid powder particles
3 (with or without interparticle bonding); b) stochastic foam; c) porous or solid
4 materials; d) periodic cellular structures; e) solid powder aggregates; f) lightweight,
5 highly compliant materials such as elastomers; g) low density polymers, metal,
6 ceramic or polymer foams; or h) polymer cast into the cellular housing (or cellular
7 core itself), or combinations thereof or other non-limiting arrangements.

1 20. The structure of claim 4, wherein at least a plurality of said cellular
2 housings have a hexagonal shape.

1 21. The structure of claim 20, wherein at least a plurality of said cellular
2 cores have a shape of at least one of tripod truss, quad pod truss, tetrahedral, cube,
3 hexagon, pyramidal, kagome, cube, hexagon, cluster of solid or hollow spheres, or
4 combinations thereof or other non-limiting arrangements.

1 22. The structure of claim 20, wherein at least a plurality of said cellular
2 cores comprise open and/or closed cell foams or other porous materials.

1 23. The structure of claim 20, wherein at least a plurality of said cellular
2 cores comprise granular powders or other porous materials.

1 24. The structure of claim 20, wherein at least a plurality of said cellular
2 cores comprise at least one of a) random aggregate of hollow or solid powder particles
3 (with or without interparticle bonding); b) stochastic foam; c) porous or solid
4 materials; d) periodic cellular structures; e) solid powder aggregates; f) lightweight,
5 highly compliant materials such as elastomers; g) low density polymers, metal,
6 ceramic or polymer foams; or h) polymer cast into the cellular housing (or cellular
7 core itself), or combinations thereof of or other non-limiting arrangements.

1 25. The structure of claim 4, wherein said second panel is bonded to at
2 least one of said arrays, wherein said bond is at least one of brazing bonded, other
3 transient liquid phase bonded, UV welding bonded, adhesives, resistance welding,
4 laser welding bonded, or diffusion welding bonded.

1 26. The structure of claim 4, wherein said structure partially comprises a
2 double ship hull.

1 27. The structure of claim 4, wherein said structure comprises a double
2 ship hull.

1 28. The structure of claim 4, wherein said structure comprises at least one
2 of: architecture (for example: pillars, walls, shielding, foundations or floors for tall
3 buildings or pillars, wall shielding floors, for regular buildings and houses), civil
4 engineering field (for example; road facilities such as noise resistant walls and crash
5 barriers, road paving materials, permanent and portable aircraft landing runways,
6 pipes, segment materials for tunnels, segment materials for underwater tunnels, tube
7 structural materials, main beams of bridges, bridge floors, girders, cross beams of
8 bridges, girder walls, piers, bridge substructures, towers, dikes and dams, guide ways,
9 railroads, ocean structures such as breakwaters and wharf protection for harbor
10 facilities, floating piers/oil excavation or production platforms, airport structures such
11 as runways) and machine structure field (frame structures for carrying system,
12 carrying pallets, frame structure for robots, etc.), the automobile (the body, frame,
13 doors, chassis, roof and floor, side beams, bumpers, etc.), the ship (main frame of the
14 ship, body, deck, partition wall, wall, etc.), freight car (body, frame, floor, wall, etc.),

15 aircraft (wing, main frame, body, floor, etc.), spacecraft (body, frame, floor, wall,
16 etc.), space station (the main body, floor, wall, etc.), and submarine (the body, frame,
17 etc.).

1 29. The structure of claim 3, wherein said first panel is bonded to at least
2 one of said arrays, wherein said bond is at least one of brazing bonded, other transient
3 liquid phase bonded, UV welding bonded, adhesives, resistance welding, laser
4 welding bonded, or diffusion welding bonded.

1 30. The structure of claim 3, wherein said structure partially comprises a
2 ship hull.

1 31. The structure of claim 3, wherein said structure comprises a ship hull.

1 32. The structure of claim 3, wherein said structure comprises at least one
2 of: architecture (for example: pillars, walls, shielding, foundations or floors for tall
3 buildings or pillars, wall shielding floors, for regular buildings and houses), civil
4 engineering field (for example; road facilities such as noise resistant walls and crash
5 barriers, road paving materials, permanent and portable aircraft landing runways,
6 pipes, segment materials for tunnels, segment materials for underwater tunnels, tube
7 structural materials, main beams of bridges, bridge floors, girders, cross beams of
8 bridges, girder walls, piers, bridge substructures, towers, dikes and dams, guide ways,
9 railroads, ocean structures such as breakwaters and wharf protection for harbor
10 facilities, floating piers/oil excavation or production platforms, airport structures such
11 as runways) and machine structure field (frame structures for carrying system,
12 carrying pallets, frame structure for robots, etc.), the automobile (the body, frame,
13 doors, chassis, roof and floor, side beams, bumpers, etc.), the ship (main frame of the
14 ship, body, deck, partition wall, wall, etc.), freight car (body, frame, floor, wall, etc.),
15 aircraft (wing, main frame, body, floor, etc.), spacecraft (body, frame, floor, wall,
16 etc.), space station (the main body, floor, wall, etc.), and submarine (the body, frame,
17 etc.).

1 33. The structure of claim 2, wherein a plurality of said arrays are bonded
2 to one another, wherein said bond is at least one of brazing bonded, other transient
3 liquid phase bonded, UV welding bonded, adhesives, resistance welding, laser
4 welding bonded, or diffusion welding bonded.

1 34. The structure of claim 1 or 2, wherein at least some of said cellular
2 housings and at least some of said cellular cores are made from a material selected
3 from the group consisting of polymers, metals, alloys, ceramics, stainless steels,
4 aluminum alloys, and titanium alloys.

1 35. The structure of claim 1 or 2, wherein at least some of said cellular
2 housings and at least some of said cellular cores are made from composites formed of
3 one or more of a material selected from the group consisting of polymers, metals,
4 alloys, ceramics, stainless steels, aluminum alloys and titanium alloys .

1 36. A method of constructing a structure comprising:
2 providing a plurality of cellular housings;
3 disposing at least one cellular core in at least a substantial number of said
4 cellular housings; and
5 bonding said cellular housings together to form at least a first array.

1 37. The method of claim 36, further comprising:
2 bonding said cellular housings together to form at least a second array.

1 38. The method of claim 36, further comprising:
2 bonding at least a first panel to said first array.

1 39. The method of claim 36, further comprising:
2 bonding at least a second panel to at least one of select said arrays.